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PHOTOGRAPHIC INTELLIGENCE MEMORANDUM

EVALUATION OF 127MM [REDACTED] LENS

25X1A

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Central Intelligence Agency
Office of Research & Reports

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*Enclosure
J.W. will furnish later*

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EVALUATION OF 127 MM [REDACTED] LENS

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Purpose: To investigate the physical and performance characteristics of the [REDACTED] lens in comparison with other lenses and to determine its area of application in intelligence photography.

Background: The [REDACTED] Lens was designed and produced in 1952 by the [REDACTED] Manufactured in response to a requirement from the Physical Security Equipment Agency, the lens was reputed to resolve a phenomenal 250 lines per millimeter.

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With the claimed resolving power in mind it was theorized that when [REDACTED] lens should produce photographs of quality equal or superior to those exposed through the various twenty inch focal length mirror optic lenses presently in use. This report covers the tests and results of an investigation made to determine the accuracy of that theory.

Test procedures and results:

1. Testing was conducted on a comparative basis using the following four lenses: (see photo enclosure 1)

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- a. 50mm Fl. [REDACTED] max. aperature F 2.0
- b. 127mm Fl. [REDACTED] max. aperture f 2.0
- c. 135mm Fl. [REDACTED] max. aperture f 4.5
- d. 450mm Fl. [REDACTED] Fixed aperture f 5.6

2. Physical Characteristics:

	<u>Weight</u>	<u>Length(less Camera)</u>	<u>Max. Diam.</u>	<u>Finish</u>
50mm	.37 lb	1-3/8 inches	2 in.	Bright Chrome
127mm	.70 lb	5-1/2 inches	2 1/4 in.	Satin Chrome
135mm	3.12 lb	6 1/4 inches	3-1/2 in.	Low Gloss Black

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	<u>Weight</u>	<u>Length(less Camera)</u>	<u>Max. Diam.</u>	<u>Finish</u>
450mm	2.75 lbs	7" and lens shade	4 inches	Low Gloss Black

3. Optical Characteristics:

	<u>Horizontal / of view</u>	<u>Focuses</u>		<u>Field at 100 Ft</u>
		<u>From</u>	<u>to</u>	
50mm	48°	3'	inf.	105 ft.
127mm	16°	6'	inf.	34 ft.
135mm	15°	5 ft.	inf.	31 ft.
450mm	6°	20 ft.	inf.	13.5 ft

4. Resolution tests were made at maximum apertures with the results listed below:

50mm	42 lines per mm at center
127mm	120 lines per mm in corner higher in center
135mm	60 lines per mm in center
450mm	30 lines per mm (not tested - mfgs rating)

Resolution tests were made on microfilm developed in Kodak D-11 developers. The maximum resolving power of microfilm is approximately 150 lp mm. Resulting resolutions were read with a microscope. Lenses were further tested outdoors again with microfilm over a 250 foot range using a test target composed of high contrast letters and numerals. A photo of this target is attached as photo enclosure 2. The size of the smallest letter clearly resolved by each lens is as follows:

50mm	7" letter readable but very fuzzy
127mm	1.25" letter easily read with microscope
135mm	2" letter easily read with microscope
450mm	3" letter readable but very fuzzy

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This target test was repeated using Adox KB-14 film, with development in Neodyne Blue organic developer. Adox 14 is reported to have a resolving capability only slightly below that of microfilm. Results are attached hereto as enclosures 3 through 6.

As a final empirical test all four lenses were used on the "cat cracker" and fractionating towers of the Baltimore Esso refinery. Adox film was used and all photos were taken from the same camera station. Photo enclosures 7 through 12 present the results of this testing. It must be remembered in viewing these photographs that they can only be as "sharp" as the enlarger lens through which they were projected. Therefore photo quality will appear to be about the same. Proper evaluation is best accomplished again via the microscope from the negative.

Discussion:

25X1A Examination of the data presented here and the accompanying photographs establishes the soundness of the premise that the [REDACTED] lens will produce photographic results equal to the particular 450mm lens used in these tests. However, the testing officer does not feel the 450mm lens results that form a part of this report are true measure of the lens' capability. They do represent a fair example of field use results. This type of lens is very susceptible to vibration and the experimental poor results represent the image degradation caused by moderate winds despite every effort to achieve vibration free exposures.

The collection of intelligence photography under discreet or clandestine conditions must be planned to produce photographs yielding a maximum amount, or at least a predetermined amount, of detail.

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